

PRELIMINARY ANALYSIS OF DIONE REGIO, VENUS: THE FINAL MAGELLAN REGIONAL IMAGING GAP.; S.T. Keddie, Dept. of Geological Sciences, Brown University, Providence, RI, 02912.

Introduction: In September, 1992, the Magellan spacecraft filled the final large gap in its coverage of Venus when it imaged an area west of Alpha Regio. F-BIDR's and some test MIDR's of parts of this area were available as of late December. Dione Regio had been imaged by the Arecibo observatory and a preliminary investigation of Magellan images supports the interpretations made based on these earlier images (Keddie et al., 1990; Senske et al., 1991): Dione Regio is a regional highland on which is superposed three large, very distinct volcanic edifices. The superior resolution and different viewing geometry of the Magellan images has also clarified some uncertainties and revealed fascinating details about this region.

Observations: Dione Regio extends from approximately 20°S to 45°S and from 315° to 335°, covering an area of about 2700 x 1200 km. Superposed on this 1-1.5 km region of elevated plains are numerous small shields and three volcanic edifices: Ushas Mons (≈500 km diameter) in the north; Innini Mons (≈600 km diameter) 1050 km to the SSE; and Hathor Mons (≈500 km diameter) 600 km SW of Innini. These edifices have been described elsewhere (Senske et al., 1991) and, interestingly, the major characteristics of the volcanoes are unchanged. Ushas Mons is radar-bright with many distinct, overlapping flow units and a dark summit region. Innini Mons is radar-dark with a few well-defined flows distally and a diffuse summit. Hathor Mons has a diffuse, radar-bright summit region and poorly defined flanks. Many details of these edifices revealed by Magellan give a new perspective on the nature and development of these volcanoes.

Ushas Mons in many ways is similar to Sif Mons; it has numerous flow episodes, overlapping bright and dark flows near the summit, distal flows which surround and partly bury small cones on the flanks of the volcano, and possible capture of distal flows by pre-existing fractures to the northwest of the summit. Unlike Sif, there is no summit caldera, although images of possible small cones observed in Arecibo data on the eastern half of the summit have not yet been processed. Two zones of narrow fractures tens of kilometers long extend away from the summit to the north and south. The southern set fans slightly and makes a small angle with the northern set.

Innini Mons also has a set of fractures extending to the south of the volcano and arcing in towards Hathor Mons. This fracture set, however, is comprised of shorter and less distinct fractures than those at Ushas. Lava flows extend away from the summit region, particularly to the north and northwest. These flows are generally radar-dark, though distally many have relatively brighter edges, suggesting rougher flow margins. The summit of Innini is complex, with a mesa-like dome surrounded by bright deposits, a tick-like feature, and an irregular dome.

To the south of Innini is a 50 km diameter impact crater with bright crater flows extending down the regional slope to the northeast. The flows appear to be confined by narrow ridges in

ANALYSIS OF THE FINAL MAGELLAN GAP IMAGES: Keddie, S.T.

the plains, suggesting that they are relatively thin. Although this feature was observed in the Arecibo images, poor resolution of the rim and the association with apparent lava flows made its identification as an impact crater ambiguous.

Hathor Mons has a well-developed rift zone cutting through it in a northwest-southeast orientation. The fractures of this zone are obscured at the summit by bright diffuse deposits and a variety of structures. A large tick (20-25 km) dominates the summit at the southwestern side. Further north and east are several small pits ranging in diameter from 2 to 12 km and a nested caldera-like depression with bright flow deposits surrounding it. A fan of graben extend south from this caldera and appear to be superposed by deposits associated with the tick at their western edge. Other graben degrade into chains of pits. The summit graben form an arc which extends discontinuously to the southwest, forming a third arm of the rift zone cutting the edifice. A more complete picture of Hathor Mons is needed to determine more precisely the relative ages of rifting and volcanism.

Conclusions: On the basis of the Arecibo images it was suggested that the differences in major characteristics of the three volcanoes may be indicating different styles of eruption with the bright well-defined flows of Ushas Mons pointing to a relatively effusive nature and the diffuse deposits of the other two, particularly Hathor Mons, suggestive of possible explosive activity. Although it was considered that the variation in incidence angle (26° at Ushas to 37° at Hathor) might be contributing to apparent differences in major characteristics of individual volcanoes, the complimentary nature of the Magellan incidence angles (35° at Ushas to 28° at Hathor), as well as a nearly 90° change in look direction, suggests that these variations are in fact real. A detailed look at the summit regions supports this suggestion: Innini and Hathor both have steep dome and tick-like features associated with bright diffuse deposits whereas the only summit features on the western half of Ushas Mons observed at the time of writing are a few small (<2 km) pits and cones. The relative development of fractures and rifts at the three volcanoes also indicates that they have had different histories. Preliminary interpretations suggest that this region is most similar to Western Eistla Regio in that it is a broad regional rise with superposed focused volcanism and rifting and fracturing that has not developed as fully as it has at Beta Regio. Both areas have experienced minor distributed volcanism on the plains surrounding the major edifices in the form of shield fields and mid-sized volcanic centers and there are indications of variations in style at the major edifices, although this is probably better developed at Dione. At Western Eistla a detailed chronology has been established (Senske et al., 1992) but it does not appear that overlapping flow units are present at Dione to give the relative ages of the three edifices. A more complete picture of the region, particularly a detailed analysis of the fractures, may provide the needed evidence to build a stratigraphic history of the region which will serve as a basis for a more detailed comparison with similar rises.

References: Keddie, S.T., et al., 1990, LPSC XXI, pp. 615-616; Senske, D.A., et al., 1991, EMP 55, pp. 97-161; Senske, D.A., et al., 1992, JGR 97 E8, pp. 13395-13420.